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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/656,165	09/08/2003	Sungkwon Chris Hong	M4065.0916/P916	1326
24998	7590	10/16/2006	EXAMINER	
DICKSTEIN SHAPIRO LLP			YAM, STEPHEN K	
1825 EYE STREET NW			ART UNIT	
Washington, DC 20006-5403			PAPER NUMBER	
			2878	

DATE MAILED: 10/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/656,165

Applicant(s)

HONG ET AL.

Examiner

Stephen Yam

Art Unit

2878

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-4, 6-28 and 30-50 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 2, 3, 8-23, 28, 30-42, 44, 47 and 48 is/are allowed.
- 6) ☒ Claim(s) 1, 6, 7, 24, 26, 27 and 49 is/are rejected.
- 7) ☒ Claim(s) 4, 25, 43, 45, 46 and 50 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This action is in response to Amendments and remarks filed on July 14, 2006. Claims 1-4, 6-28, and 30-50 are currently pending.

#### ***Claim Objections***

1. Claims 43 and 49 are objected to because of the following informalities:

In Claim 43, "said contacts" lacks proper antecedent basis, and it appears the remainder of the limitations are already included in parent Claim 20.

In Claim 49, "said first surface level" and "said substrate" lack proper antecedent basis. Appropriate correction is required.

#### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 6, 7, 24, 26, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kwon US Patent No. 6,809,309 in view of Jung US Patent No. 5,313,080.

Regarding Claims 1 and 6, Kwon teaches (see Fig. 4A and 6) a pixel sensor cell comprising a substrate (61, 62), a photoelectric conversion device (46/ 63,64) comprising a region (64) of a first conductivity type (p-type) at a surface of the substrate (see Fig. 6) and a region (63) of a second conductivity type (n-type) below the first conductivity type region, a gate

Art Unit: 2878

(68) located over said photoconversion device (see Fig. 6), a contact (attached to Px- see Fig. 4A) connected to said gate, a charge collection region (42/67) for receiving charges from said photoconversion device (see Col. 4, lines 19-24 and Col. 5, lines 24-27, 55-58), and a transistor (45/65) (see Fig. 4A and 6) for transferring charge from said photoconversion device to said charge collection region (see Col. 4, lines 11-14 and Col. 5, lines 55-58). Kwon does not teach the photoconversion device as a pinned photodiode having a pinning voltage and the gate for changing the pinning voltage. Jung teaches (see Fig. 1, 2) a similar pixel cell with a photoconversion device (3, 4) as a pinned photodiode (see Col. 3, line 66 and Col. 4, lines 35-41) having a pinning voltage (see Col. 4, lines 25-37) and a gate (7) located over the photoconversion device for changing the pinning voltage (see Col. 4, lines 25-31). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the photoconversion device as a pinned photodiode having a pinning voltage and a gate for changing the pinning voltage, as taught by Jung, in the device of Kwon, to maximize charge storage and transfer for the photoconversion signal, as taught by Jung (see Col. 4, lines 45-49).

Regarding Claim 7, Kwon teaches the charge collection region comprising a floating diffusion region (see Col. 5, lines 24-27).

Regarding Claim 24, Kwon in view of Jung teach the elements in Claim 1 within an imager (see Col. 2, lines 61-67) for a system. Kwon also teaches the photoconversion device located within a substrate (61, 62) (see Fig. 6) and the gate located over said substrate first surface level (see Fig. 6) and a readout circuit (44) (see Fig. 4A) comprising at least an output transistor (since the image sensor is formed on a single chip- see Col. 1, lines 21-24). Kwon does not teach the system comprising a processor. It is well known in the art to provide an image

Art Unit: 2878

processor in an image sensor system, to process the sensor output for optimizing the image for color, contrast, clarity, etc. It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a processor in the system of Kwon in view of Jung, to improve the image output for optimal imaging.

Regarding Claim 26, Kwon teaches the pixel sensor cell as part of a CMOS imager (see Col. 3, lines 63-67).

Regarding Claim 27, Kwon in view of Jung teach the system in Claim 24, according to the appropriate paragraph above. Kwon does not teach the sensor as part of a charge coupled device (CCD) imager. It is well known in the art to select between configuring an image sensor as CCD or CMOS and that a CCD imager provides greater light sensitivity for imaging. It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the sensor as part of a CCD imager in the system of Kwon in view of Jung, to provide improved detection sensitivity for improved low-light detection.

4. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kwon in view of Jung, further in view of Ohmi et al. US Patent No. 5,128,735.

Regarding Claim 49, Kwon teaches (see Fig. 4A and 6) a method of operating a sensor pixel comprising a photoelectric conversion device (46/ 63,64) having a first doped region (64) of a first conductivity type (p-type) and a second doped region (63) of a second conductivity type (n-type) beneath a first surface level of a substrate (61, 62), and a gate (68) located over the first surface of the substrate (see Fig. 6). Kwon does not teach the photoconversion device with a pinning voltage or the gate including a dielectric layer and a conductive layer. Jung teaches a

Art Unit: 2878

similar method with a photoconversion device with a pinning voltage (see Col. 4, lines 25-37).

Kwon and Jung do not teach the gate including a dielectric layer and a conductive layer. Ohmi et al. teach (see Fig. 21a, 21b) a similar device with a photoconversion device (see Fig. 21a) having a gate (271) having a dielectric layer (see Col. 41, lines 11-13) and a conductive layer (274) (see Fig. 21b), located above a substrate first surface level (see Fig. 21a). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a pinning voltage for the photoconversion device, as taught by Jung, and to provide the gate including a dielectric layer and a conductive layer, as taught by Ohmi et al., in the method of Kwon, to maximize charge storage and transfer for the photoconversion signal, as taught by Jung (see Col. 4, lines 45-49), and to improve the electrical characteristics of the gate for improved electrical connectivity.

***Allowable Subject Matter***

5. Claims 2, 3, 8-19, 20-23, 28, 30, 31-42, 44, and 47-48 are allowed over the prior art of record.

6. Claims 4, 25, 45-46, and 50 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. Claim 43 would be allowable if rewritten or amended to overcome the claim rejection(s) set forth in this Office action.

Art Unit: 2878

8. The following is a statement of reasons for the indication of allowable subject matter:

Regarding Claims 2, 3, 20-23, 44, 45, 47, and 50, the invention as claimed, specifically in combination with the pixel sensor cell arranged such that the photoconversion device has a reduced pinning voltage  $V_{PIN}$  when a negative bias is applied to the gate/contact, is not disclosed or made obvious by the prior art of record.

Regarding Claim 8, the invention as claimed, specifically in combination with the photoconversion device having a pinning voltage, a dielectric substance layer formed above the first surface level of the substrate forming a second surface level, a polysilicon layer formed over the second surface level, and a contact connected to the polysilicon layer for using a voltage to change the pinning voltage, is not disclosed or made obvious by the prior art of record.

Regarding Claim 4, 25, and 28, the invention as claimed, specifically in combination with the photoconversion device having a pinning voltage, with a gate for changing the pinning voltage including a dielectric and a polysilicon layer, is not disclosed or made obvious over the prior art of record.

Regarding Claim 30, the invention as claimed, specifically in combination with the photoconversion device having a pinning voltage, a gate including a dielectric layer over the first surface level of the substrate and a polysilicon layer over the dielectric layer, a contact connected to the gate, wherein the gate is operable to reduce an energy barrier between the photoconversion device and the charge collection region, is not disclosed or made obvious by the prior art of record.

Art Unit: 2878

Regarding Claim 46, the invention as claimed, specifically in combination with the photoconversion device having a pinning voltage and a gate for changing the pinning voltage, wherein the gate reduces an energy barrier between the photoconversion device and the charge collection region, is not disclosed or made obvious by the prior art of record.

### ***Response to Arguments***

9. Applicant's arguments with respect to claims 1 and 24 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Lee et al. US 5,625,210 and Fox US 6,566,697 teach similar devices with pinned photodiodes.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period



Art Unit: 2878

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

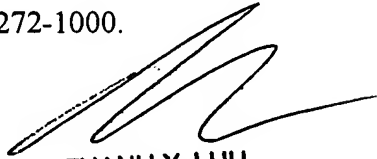
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Yam whose telephone number is (571)272-2449. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on (571)272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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THANH X. LUU  
PRIMARY EXAMINER